

Supporting Information for

Thermally Degradable Ligands for Nanocrystals

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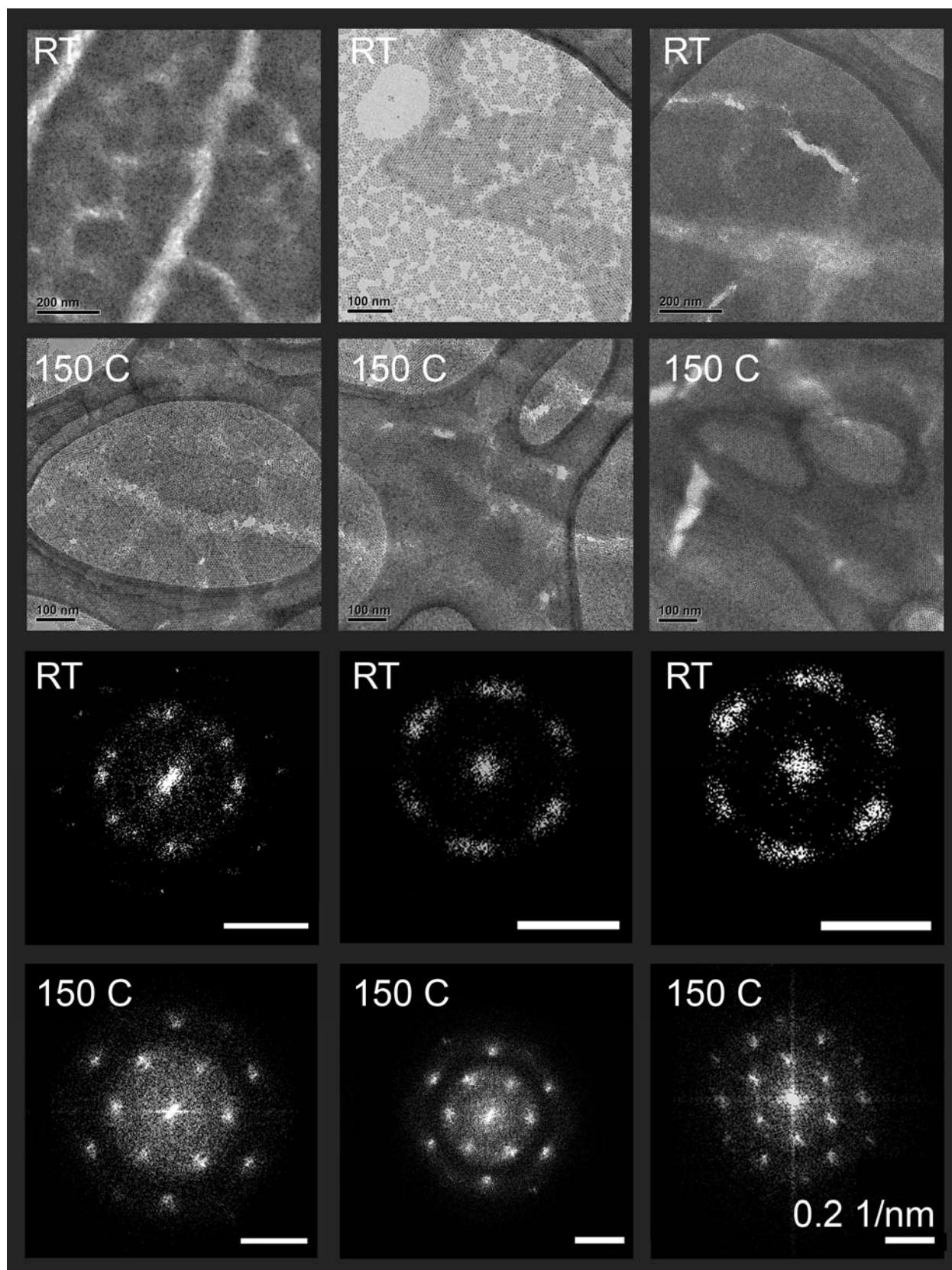


Figure S1 Representative, low-resolution TEM images (top two panels) and their Fourier-transforms used to obtain interparticle spacings of room temperature (RT) and

films annealed at 150 °C. An additional three images were taken at each temperature and the interparticle spacing obtained from their Fourier-transforms were averaged with those shown to obtain averaged interparticle spacings of 1.5 nm (RT) and 1.0 nm (150 °C).

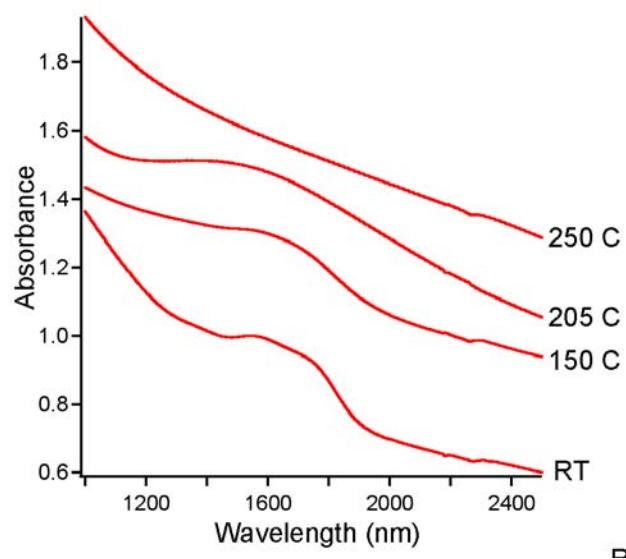


Figure S2 Near-infrared (NIR) absorbance spectra for PbSe/CdSe nanocrystal films as prepared at room temperature (RT) and after heating for one minute to the temperatures given.

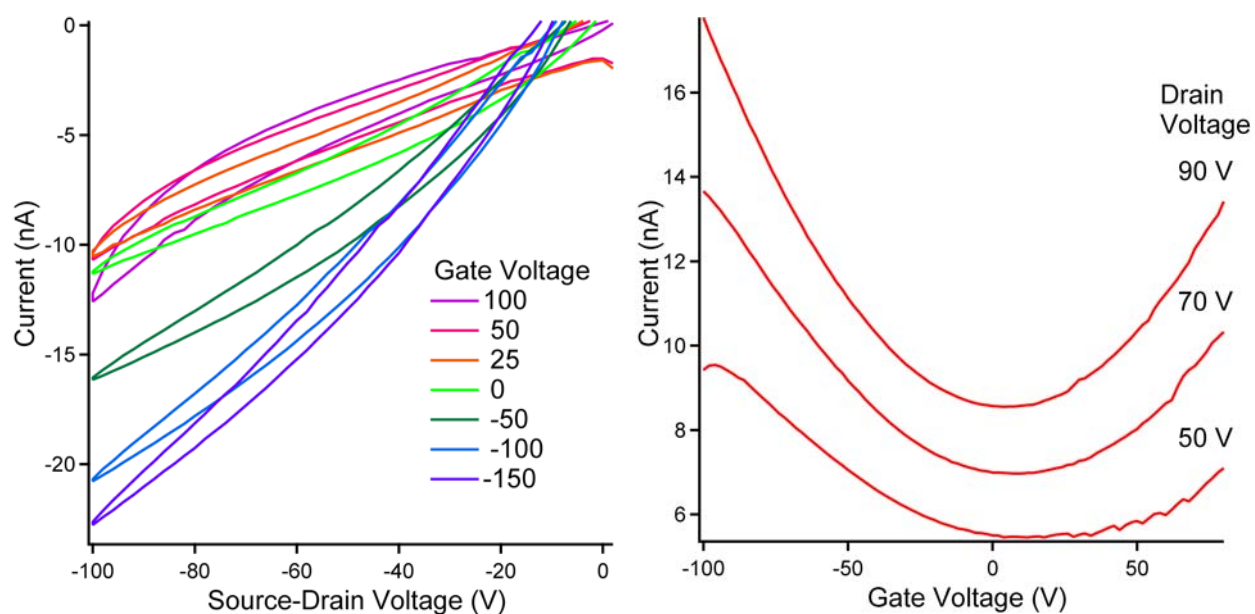


Figure S3 Output (left) and transfer (right) curves for a thin-film transistor prepared by spin-casting a ~ 80 nm thick film of PbSe/CdSe core/shell nanocrystals on a channel with pre-patterned Au/Cr contacts and a geometry of $70\ \mu\text{m}$ long x 2 mm wide with a Au/Al gate. The “V” shape of the transfer curve is indicative of ambipolar transport.

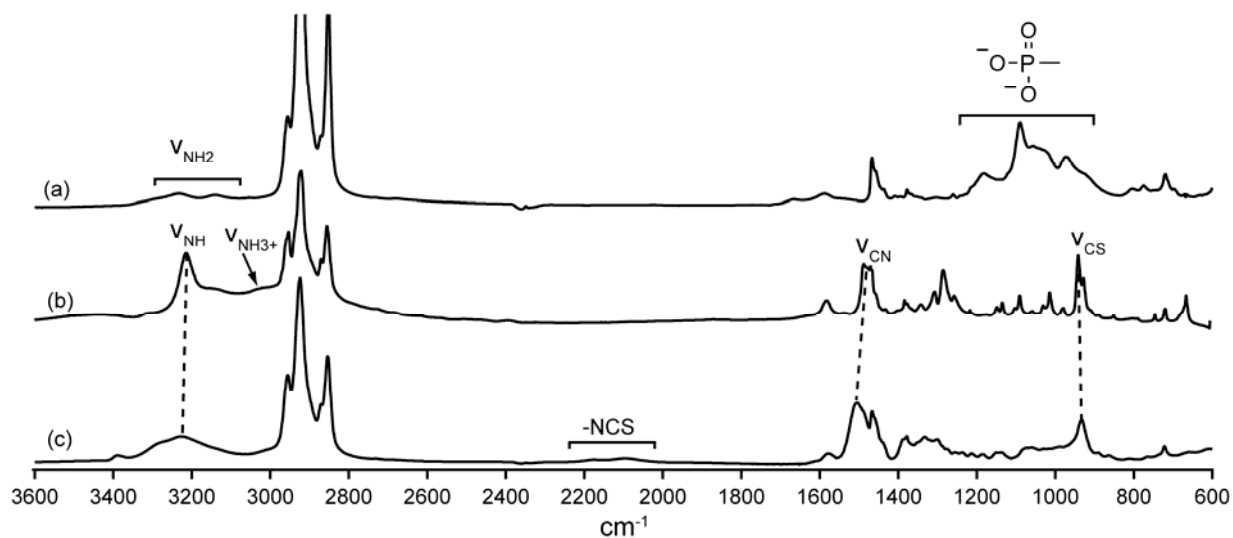


Figure S4 Infrared absorbance spectra of (a) a film of as-synthesized CdSe nanocrystals capped with phosphonic acid and anhydride,^{1,2} (b) octylammonium octyldithiocarbamate in a KBr pellet, and (c) a film of the octyldithiocarbamate-exchanged nanocrystals, showing successful ligand exchange and minimal degradation to octyl isothiocyanate.

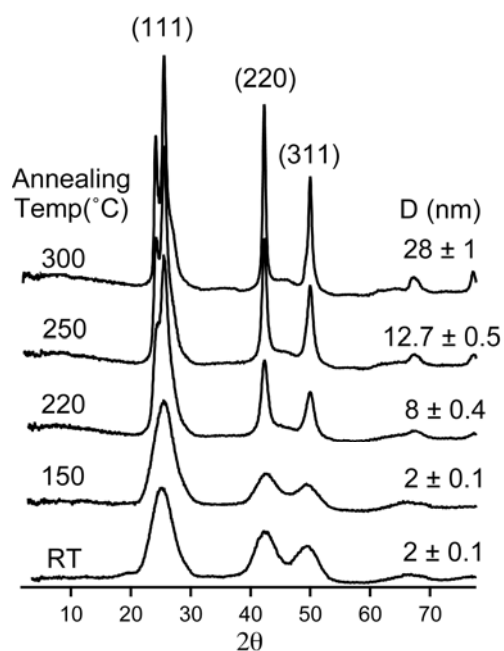


Figure S5 X-ray diffraction pattern of dithiocarbamate-treated CdSe films spin-cast on silicon and annealed for 1 minute under nitrogen to the specified temperatures. A sample kept at room temperature (RT) is shown for comparison. The diameters shown were obtained by fitting the width of the (220) peak using the JADE 8.0 software package.

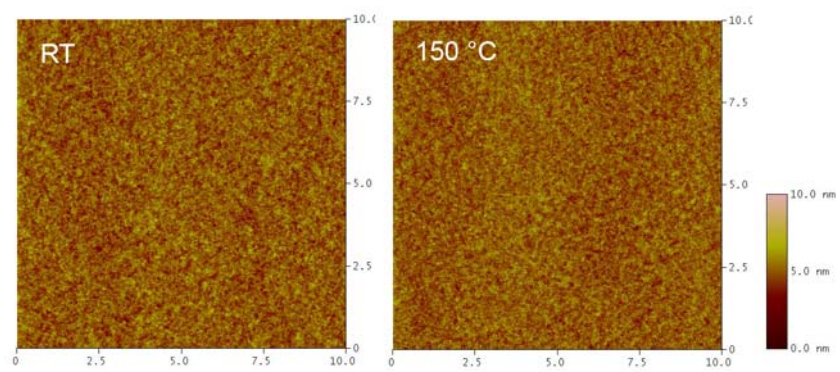


Figure S6 Atomic force micrographs of films of octyldithiocarbamate-treated CdSe spin-cast from 20 mg/mL in chloroform. Micrographs were obtained on as-cast films kept at room temperature (RT) and those heated for one minute at 150 °C. Root mean square roughnesses were 0.659 nm for the RT sample and 0.619 nm for the 150 °C sample.

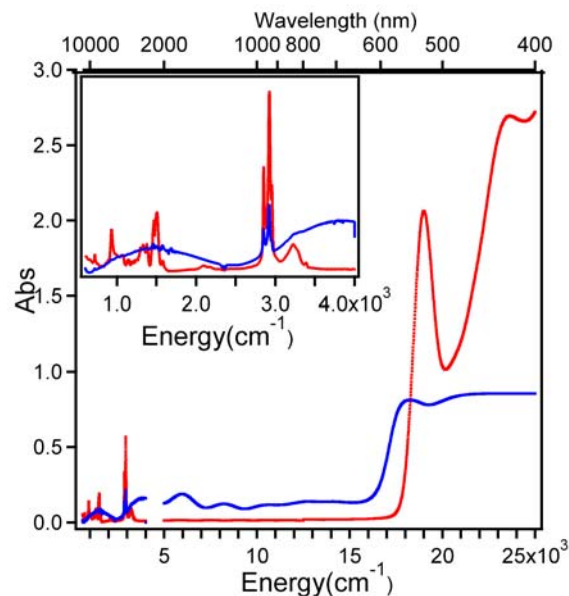


Figure S7 Optical spectra of a spin-cast film of octyldithiocarbamate-treated CdSe nanocrystals at room temperature (red) and after annealing to 150 °C for 1 minute under nitrogen (blue). After annealing, the films show a mirror finish to the eye, which may indicate that the observed change in the visible portion of the spectrum is due to increased reflectivity instead of decreased absorbance. The infrared region of the spectrum shows a substantial decrease in the intensity of ligand peaks. A dramatic increase in the interference fringes also occurs. Fitting the fringes to a simple two-mirror interferometer indicated both enhanced reflectivity and a larger dielectric constant. This may be due to surface smoothing and film densification due to ligand loss during annealing.

SUPPORTING INFORMATION REFERENCES

1. Owen, J. S.; Park, J.; Trudeau, P.; Alivisatos, A. P. Reaction Chemistry and Ligand Exchange at Cadmium–Selenide Nanocrystal Surfaces. *J. Am. Chem. Soc.* **2008**, *130*, 12279-12281.
2. Silverstein, R. M., *Spectrometric Identification of Organic Compounds*. 6th ed.; Wiley: New York, 1998; p 482.